G 27A

REGIONAL GRAVIMETRIC GEOID FOR HUDSON BAY

Saburi John, Department of Surveying Engineering, University of New Brunswick, Fredericton, N.B. Canada.
Sponsor: Dr. Petr Vanicek

Detailed geoid undulations for the Hudson Bay region are computed using detailed terrestrial gravity data and geopotential coefficients of the Godard Space Flight Center (GEMIO). Here the GEMIO solution is used as a reference spheroid to which the detailed contributions of the terrestrial gravity data are added -- these being evaluated using a modified Stoke's function $S^*(\psi)$.

The results are compared with a solution obtained by using a combination of collocation (for the area close to the computation point) and Stoke's formula (for distant zones). The result shows that there is a good agreement indicated by a r.m.s. difference of 1.08 m.

In the present solution the geoid heights are derived with an accuracy of $\pm$ 0.2 m to $\pm$ 1.2 m. The indirect effect on this geoid is found to have a maximum value of about 3 m which is the size that one would expect from a free air geoid. The geoid should be useful for oceanographic studies in Hudson Bay.

GP 99A

REGIONAL RESISTIVITY STRUCTURE AT THE ROOSEVELT HOT SPRINGS, UTAH, KGRA FROM MAGNETOTELLURICS: INTERPRETATION OF OBSERVED DATA

Stanley H. Ward (Dept. of Geology & Geophysics, Univ. of Utah, Salt Lake City, Utah, 84112)
Philip Wannamaker (Univ. of Utah)

Based upon the conclusions of 3-D numerical modeling studies, we have interpreted an east-west profile of thirteen MT soundings across the Milford Valley sediments and Mineral Mts in the vicinity of the Roosevelt Hot Springs (RHS) with a 2-D transverse magnetic (TM) algorithm. An excellent fit to the observed apparent resistivity and impedance phase results was obtained along with realistic geoelectric sections that compare well with independent geological and geophysical evidence. Quaternary and Tertiary valley fill extends to a depth of about 2 km and possesses resistivities as low as 1 Ω-m. No lateral inhomogeneities below 3 km appear to affect the measurements in the RHS area. The resistivity structure below this depth may therefore be interpreted as a regional 1-D host structure controlled by the average composition and physico-chemical conditions as a function of depth of the deep crust and upper mantle. Of particular interest, a low-resistivity layer (20 Ω-m) has been isolated in the upper mantle from 35 to 65 km. The geometry and intrinsic resistivities of the 1-D regional model compare well with laboratory investigations of electrolytic conduction in aqueous pore fluids, solid-state semiconduction in minerals and electrolytic conduction in partial melts. A possible high resistivity contrast associated with the Basin-Range to Colorado Plateau transition about 100 km to the east does not appear to have a measurable effect on our observations at RHS.

H 6A

STATISTICAL ANALYSES OF LANDFILL-GENERATED METHANE GAS DATA

Edward A. McBean (Dept. of Civil Engineering, University of Waterloo, Waterloo, Ontario)
Anthony J. Crutcher (Conestoga-Rovers & Associates, 651 Colby Drive, Waterloo, Ontario, Canada)

As part of a research study conducted by Conestoga-Rovers & Associates under contract with Environment Canada, methane concentration and pressure data collected from monitoring probes located radially away from a gas extraction well on the St. Thomas landfill site are examined, with a view to understanding spatial and temporal variabilities. Statistical characterizations demonstrate the extent to which the concentration and pressure variations increase/decrease with increased depth and proximity to the gas extraction well. Concentrations do not appear to be strongly a function of direction, suggesting there is not a strong non-isotropic phenomenon governing the gas movement. Fitted regression equations are shown to have promise as a means of inferring data at points for which no data exists. Use of moving average analyses is used to identify a zone of influence, a concentration change (per cent by volume), as a result of pumping from the gas extraction well.

H 22A

SOIL WATER BALANCES OF FOREST AND GRASS USING THE ZERO FLUX PLANE METHOD

J.D. Cooper (Institute of Hydrology, Maclean Building, Crowmarsh Gifford, Oxon, UK)
(Sponsor: P. E. O'Connell)

A comparison of the water balances of forested and grassed plots within Thetford Forest, Norfolk, England has been conducted for three years using the zero flux plane (ZFP) method for summer conditions. During winter a simple soil water balance using meteorological evaporation estimates has been used.

The ZFP method has been found to have advantages over the more common direct solution of Darcy's Law for water resources application because:-

(i) no hydraulic conductivity determinations need to be made

(ii) spatial variability of the estimates is smaller than reported values obtained by the Darcy method

(iii) the method is less sensitive to obtaining accurate potential profiles

A disadvantage is the reliance on meteorological estimates during the winter. The evidence suggests that hypothetical problems caused by root extraction below the ZFP are minimal.

Over the three years water use by the forest was some 49% greater than from the grass plot. This difference was caused mainly by evaporation of intercepted water from the forest canopy, which was 41% of all forest evaporation.

Signficant amounts of drainage beneath the plots occurred during periods of moisture deficits.

H 45A

ASSESSMENT OF FLUOROCARBON TRACERS FOR TRACING GROUNDWATER

G. M. Thompson, G. R. Walter, G. K. Stiles (Dept. of Hydrology and Water Resources, University of Arizona, Tucson, AZ 85721)

A group of 6 fluorocarbon compounds have been tested to varying degrees to assess their potential as groundwater tracers. The compounds tested were CCl_3F, CCl_2F_2, $CClBrF_2$, CBr_2F_2, $C_2Cl_3F_3$, $C_2Br_2F_4$. The compounds have been evaluated in terms of their sorption characteristics, their relative detectability, and handling characteristics. The evaluation included both laboratory and field testing. In conclusion the following points can be made regarding the utility of the fluorocarbon tracers: (1) they are particularly desirable in terms of their detectability, being optimally measurable in the low part per trillion range; (2) most have very low toxicity making them usable in virtually any water supply; (3) they are extremely stable requiring no special preservation methods; (4) they are generally nonconservative, some of the fluorocarbons are strongly sorbed on the silicate aquifer materials; (5) they are highly volatile and have low solubility in water. This aspect presents significant handling problems during tracer injection, sample collection and sample storage, and limits their applicability to field problems that are carried out entirely within the saturated zone.

H 57A

SAMPLING FOR MIGRATION FROM A SOLID RADIOACTIVE WASTE DISPOSAL PIT

W.D. Purtymun, Los Alamos Scientific Laboratory, Los Alamos, NM 87545

M.A. Rogers, M.L. Wheeler (Sponsor: A.K. Tyagi)

Horizontal holes were cored beneath a radioactive waste disposal pit at Los Alamos, NM. Samples of the core were analyzed for radioactive elements known to be in the pit, including fission products, uranium, and trans-uranic elements. None of the man-made elements were present in the samples at levels above the minimum detection limits. Gross alpha, gross beta, and uranium activity was detected in the samples. Statistical comparisons were made to identify any significant variations from natural background concentrations. The comparisons demonstrated that none of the radioactivity detected in the samples can be attributed to migration from the disposal pit.

H 57B

SIMULATION OF POLLUTANT DISPERSION IN GROUNDWATER SYSTEMS

A. K. Tyagi (Civil Engineering Dept., University of Kansas, Lawrence, KS 66045)

The paper presents the modeling of beneficial and hazardous pollutants in groundwater environment. The dispersion theory in saturated porous media is applied to chemical, radioactive, biological, and thermal pollutants that are disposed of in aquifers. Deterministic approach presented in this paper includes the finite-difference and finite-element models. Phenomena of convection, dispersion, absorption, and decay are included in the models simulating and predicting the distribution of various pollutants. Research needs in the area of mathematical modeling of pollutants in saturated zones of aquifers are discussed.

O 2A

RADAR ALTIMERY/NUMERICAL CIRCULATION MODEL COUPLING

P. Cornillon (Department of Ocean Engineering, University of Rhode Island, Kingston, RI 02881)
M. Spaulding
C. Swanson
M. Reed

SEASAT-1 radar altimeter data is compared with sea level predictions from a three dimensional numerical circulation model for the Georges Bank/Gulf of Maine area. The radar altimetry is also compared with empirical predictions of the sea level based on historical tidal data available from a number of points within the study area.

The most severe problems encountered in the processing of the radar altimetry were errors arising from orbital bias and tilt. Following removal of earth and ocean tides using a global tidal model, a linear correction was made to the observed sea level such that it coincided with the local geoid in deep water. This linear correction factor was applied to produce bias and tilt corrected estimates of sea level for the continental shelf study area.

The numerical model, using a semi-implicit time integration procedure to remove the surface gravity wave time step restriction, is capable of responding to all significant forcing mechanisms of shelf circulation. In the cases presented here, sea level and wind forcing were investigated.

O 54A

ANTARCTIC BOTTOM-WATER TRANSPORTATION HISTORY RECORDED IN SUB-ANTARCTIC SEDIMENT CORES

G. A. Mead, T. C. Huang, J. P. Kennett(all at: Graduate School of Oceanography, University of Rhode Island, Kingston, RI 02881) and
D. F. Williams (Department of Geology, University of South Carolina, Columbia, SC 29208)

Detailed chronology, stable isotopic ($\delta O^{18}/O^{16}$- δC^{13}) stratigraphy, sedimentology, and X-ray radiography have been made for piston cores north of the Ross Sea. Temporal variation of Antarctic Bottom-Water production was established based on factor analysis of the benthic foraminiferal assemblages. Periods of the inferred increased bottom-water production generally coincide with warm climate episodes. These core intervals are marked by high concentrations of glacial-marine sediments, current produced laminae and preferential grain orientations due mainly to increased traction transport by bottom currents.

To obtain the competence variations of the bottom currents, a scanning electron microscopic (SEM) analysis has been made on the variability of surface microfeatures on quartz grains. More than ten different features were combined into three groups: glacial, subaqueous, and dissolution. The percents of the surface areas covered by these three kinds of features were estimated for 12 selected size ranges. The data show that the percent subaqueous features increases gradually during interval of increased bottom-water production. Grain sizes associated with maximum percentages of subaqueous features increase in intervals from low to high bottom-water production. These size fractions may have been transported dominantly by bottom traction. The finer particles were mainly in suspension and/or saltation while the larger grains remained relatively unabraded during transportation. These, together with the grain-size distribution data were used to delineate the bottom current competence and its temporal and spatial variations.

O 143A

OBSERVATIONS OF INERTIAL AND PRINCIPAL TIDAL CURRENTS IN THE DRAKE PASSAGE

R. D. Pillsbury (School of Oceanography, Oregon State University, Corvallis, OR 97331)
W. D. Nowlin, Jr. (Department of Oceanography, Texas A&M University, College Station, TX 77843)
Joseph Bottero (School of Oceanography, Oregon State University, Corvallis, OR 97331)

A general preliminary description of the inertial and the principal tidal (S_2, M_2, K_1, O_1 and M_f) currents in Drake Passage is presented, based on data collected during 1976 through 1978. Unfiltered rotary spectra for 0.5 to 2.5 cpd are presented to show and compare the semi-diurnal, diurnal and inertial components as a function of latitude across the passage.

The semi-diurnal tides have greater amplitudes in northern than in central or southern passage locations. By comparison, the diurnal tides, which are less energetic than the semi-diurnal, have their greatest amplitudes in the southern passage. The mean tidal ellipses of the semi-diurnal tides are more nearly circular than for diurnal tides. Time histories of these tidal components are presented.

The inertial currents are examined and compared to changes in the wind stress. The correlations between the wind stress and inertial current kinetic energy are significant, but usually only very slightly above the 95% significance level. In general the amplitude of the inertial motion decreases with increasing depth as expected.

O 174

ANOMALOUS PLUTONIUM CONCENTRATIONS IN NEAR-SHORE MARINE SEDIMENTS OF THE GULF OF MEXICO

M. R. Scott
P. F. Salter (both at Dept. of Oceanography, Texas A&M University, College Station, TX 77843

The Mississippi River delivers 4.2 x 10^{12} dpm/y to the Gulf of Mexico (GOM) associated with river sediment. The average content of Pu in the Mississippi River sediment is 15 dpm/kg. Studies of the Fe, Mn, and Al content of the river sediments show a strong positive correlation between Pu and both Mn and Fe. Mn oxides have been suggested as the phase controlling distribution of Pu and other trace elements in soils and sediments.

We also analyzed Pu, Fe, Mn, and Al in 8 cores from the GOM. Two delta cores showed total Pu inventories of 745% and 421% of the predicted fallout values. A third delta core contained 48% of the predicted value. Sediment in deeper water contained 10-20% of the predicted fallout Pu inventories. Accumulation of greater than 100% of predicted Pu inventories in delta cores may result from deposition of Pu from the large river drainage basin in the much smaller delta area by sedimentary processes.

The absolute Pu concentrations in delta sediments are also high, up to 110 dpm/kg. Mn in delta sediments has been reduced and has diffused out, so that the Pu-Mn association no longer holds. Increased Pu concentrations in the delta may result from a process related to dissolution of the Mn substrate and possible remobilization of Pu. Scavenging of Pu from the open GOM is another possibility. Low Pu content of deep GOM sediments may reflect removal to shelf sediments, or deposition rates slow in comparison to the rate at which the Loop Current replaces GOM water with water from lower latitudes which have received less fallout Pu.

O 262A

WATER MASS PROPERTIES AND ZONAL GEOSTROPHIC TRANSPORTS IN THE EASTERN EQUATORIAL PACIFIC

L.J. Mangum
J.R. Holbrook
S.P. Hayes (all at: Pacific Marine Environmental Laboratory, 3711 - 15th Ave. NE, Seattle, WA 98105

From February to November 1979 six meridional CTD/O_2 sections were taken along either 105°W or 110°W. The maximum latitudinal coverage was from 13°N to 5°S. Time between repeated sections varied from one week to nine months. In sections taken in February and June the North Equatorial Current was located between 9°N - 12°N. Transport in the upper 200 db relative to 500 db increased from 11Sv to 20Sv during this interval. In October much of the North Equatorial Current was north of 12°N, thus we could not estimate its transport. The North Equatorial Countercurrent located between 4°N - 9°N had fairly constant transport (16-22 Sv above 200 db); however, this current had a complicated meridional structure with several maxima. In some cases near surface westward flow was inbedded in the eastward flowing countercurrent. These features changed between sections, but some details could be traced over a one week interval. The South Equatorial Current extended southwards from about 4°N. Typical surface geostrophic velocities relative to 500 db were 70 cm s^{-1}. South of the equator this current was stronger in June than in February. All sections showed a subsurface countercurrent with maximum eastward flow of about 30 cm s^{-1} located between 3°N - 5°N at a depth of 100 - 200m. This countercurrent is associated with the northern boundary of the 13°C thermostad.

P 16A

TECTONICS OF MERCURY

R. G. Strom (Lunar & Planetary Laboratory, University of Arizona, Tucson, Az 85721)

The tectonic framework of Mercury appears to be unique among the planets explored to date. It is characterized by the widespread (probably global) distribution of large lobate scarps interpreted to be thrust or reverse faults. The widespread and more or less random distribution of these features suggests that Mercury has been subjected to a period of global compression. Estimates of the amount of crustal shortening associated with this period of compression suggest that Mercury's radius has decreased by at least 1-2 km. Scarp and plains transection and superposition relationships indicate that the period of compression occurred after emplacement of ancient intercrater plains through the formation of younger smooth plains. Thermal history models suggest that extensive melting and global expansion accompanied the formation of Mercury's massive iron core, followed by a period of global compression due to cooling of the lithosphere and/or core. Geologic mapping suggests that much of the intercrater plains are volcanic and may have been emplaced during the period of global expansion, while the lobate scarps formed in response to crustal shortening accompanying the period of cooling.

P 17A

TERRESTRIAL TECTONICS THROUGH TIME

W.S.F. Kidd (Department of Geological Sciences, State University of New York at Albany, Albany, NY 12222)

Wilson (1968) first pointed out the essential features of the tectonic record left in orogenic belts by ocean opening and closing. Sedimentary and volcanic facies and sequences show clear evidence of plate tectonic processes since 2.15 Ga ago, in particular the formation of Atlantic-type continental margins after rifting, and their destruction by collision of major continents. Some older terrains may be interpreted as products of continental collision (West Greenland), but most older than 2.5 Ga consist of assemblages derived from volcanic island arcs and marginal basins. This preponderance of arcs over continent, if the small sample of terrains unmodified since the Archaean is representative, is compatible with substantial growth through time of continental area and volume, particularly within the Archaean, by the collisional assembly of numerous island arcs. It is also compatible with the significantly greater mantle heat generation in the past, removed, as now, dominantly by convection with a boundary conduction layer (plate tectonics). Faster average plate motion and/or greater plate boundary lengths are inferred for the Archaean. More abrupt variations in the average rates of spreading and subduction are inferred from sea level changes in the Phanerozoic and are correlated with increased volumes of calc-alkaline arc rocks generated by the faster subduction; such events may be seen in the Proterozoic record, although much of the episodicity seen in Proterozoic isotopic ages is due to large continental collisions. The presence of water from early times is probably the most important factor that has influenced the tectonic behavior of the earth, due to its role in the generation of calc-alkaline magmas above subducting slabs, the first step in the production of non-subductable continents, and possibly the effects of water on the strength of mantle rocks are also important.

P 19A

LUNAR TECTONICS AND EVOLUTION OF THE LITHOSPHERE

J.W. Head (Dept. of Geological Sciences, Brown. Univ., Providence, RI 02912)
S.C. Solomon (Dept. of Earth and Planetary Sciences, MIT, Cambridge, MA 02139)

The nature of impact basin rings, the volcanic filling of the lunar maria, the formation of the mascons, the tectonic features of the Moon, and the thermal evolution of the lithosphere are all interlinked. Detailed models of the flexural response of the lunar lithosphere to the mare basalt loads at the times of emplacement of major mare units permit evaluation of the effective thickness of the elastic lithosphere. The growth of the lunar lithosphere beneath each mare basin is a natural consequence of the cooling of the outer portions of the Moon. The global synchronism for the cessation of linear rille formation (tensional features) can be explained as being due to the superposition onto local basin stress of a global thermal stress that shifted from extensional to compressional as the Moon changed from net expansion to net contraction at or before 3.6±0.2 b.y. ago. A pronounced spatial variation in effective lithosphere thickness during the time of early mare volcanism is clearly indicated. These variations likely represented large-scale inhomogeneities in the thermal structure of the lunar crust and uppermost mantle, arising from lateral variations in crustal heat sources, crustal heat transport or sublithospheric heat flow. These lateral variations appear to have influenced the formation of the outer rings of major impact basins early in lunar history.

P 20A

REVIEW OF EVIDENCE FOR A FIRST-ORDER HEMISPHERIC ASYMMETRY ON MARS

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G.F. Davies (Dept. of Earth and Planetary Sciences, Washington University, St. Louis Missouri 63130)

The center of figure of Mars is displaced from the center of mass by 2.5 km in a direction toward 62° s. lat., 272° w. longitude. This direction is approximately in the direction of the normal to the great circle separating the ancient cratered terrain in the south from the younger northern plains. These observations suggest that the crust is thickest where it is oldest. The magnitude of the hemispheric asymmetry between cratered terrain and plains is too large to be explained by surficial processes. A plausible explanation is that the asymmetry is a record of first-order convective overturn within the interior. A rising current in the northern hemisphere may have placed the crust in deviatoric tension, producing fractures and extensive volcanism. The 3 km elevation difference between the northern plains and the cratered terrain may have been accomplished by ~25% crustal extension in the north, a value also proposed for the basin and range province. Such convective processes must have pre-dated core formation, since the presence of a core would suppress the first-order overturn mode. Mars may therefore be unique among the planets in preserving a record of core formation.

P 39A

IO'S VOLCANISM AND GEOPHYSICS

D. L. Matson
T. V. Johnson (both at: Jet Propulsion Lab, Caltech, Pasadena, CA 91103

Voyager data related to Io's surface and volcanic activity will be reviewed. Volcanic activity is apparently higher on Io than on any other body in the solar system. At least eight eruptive plumes were present during the Voyager encounters. Abundant calderas and several types of lava flows dominate the appearance of the surface. The heights attained by the plumes place useful constraints on the thermodynamic process which powers them. In addition, ground-based telescopic observations of Io in the infrared can be used to derive Io's heat flow. Data taken during the last decade give a heat flow of 2 ± 1 Wm^{-2}. This is very high and implies that at least part of Io's interior is molten. The potential sources for this observed radiated power will be reviewed.

P 44A

A THERMAL MODEL OF THE MOON INCLUDING THE EFFECTS OF MAGMA MIGRATION

J. L. Ahern (School Geol. Geophys., U. Oklahoma, Norman, OK 73019)
D. L. Turcotte (Dept. Geol. Sci., Cornell U., Ithaca, NY 14853)

Magma migration has affected the thermal evolution of the moon in two important ways: First, the upward migration of melts has resulted in the redistribution of radioactive elements in the lunar interior. This has had a significant effect on the thermal history of the moon. Second, magma migration is a differentiation process, and, as such, is responsible for the formation of the lunar crust. We present a finite-difference model of the thermal evolution of the moon which includes the effects of magma migration and subsequent radioactive element redistribution. Initially, we assume the moon has a 350 km magma ocean and a uniform U concentration of 46 ppb. The ocean freezes quickly, and a second melting episode begins at 3.9 bybp and ends at 3.2 bybp. It is thought that this melting may lead to the volcanism responsible for the mare basalts. The present-day heat flow for this model is 0.50 HFU, which is about 12% higher than steady-state, and in good agreement with the heat flow estimate of 0.46 HFU based on Apollo 15 measurements.

Geophysicist. The Institute of Geophysics and Planetary Physics, Scripps Institution of Oceanography, has an opening in the assistant research series (I–III) for an individual who specializes in geophysical instrumentation, including seismic and crustal deformation instrumentation. A demonstrated capability in this field, combined with a thorough knowledge of and experience in digital signal processing, geophysical time series analysis and Fortran programing, is required. Rank and salary are commensurate with qualifications. Send resume, bibliography, brief statement of research interest and experience, and the names of three to five references to Robert A. Knox, IGPP, A-025, E, University of California, San Diego, La Jolla, CA 92093.

The University of California, San Diego, is an equal opportunity/affirmative action employer. Deadline for application is September 30, 1980.

Yale University/Assistant Professor: Theoretical Fluid Mechanics. Applications are solicited for a junior faculty position in the field of theoretical fluid mechanics. It will begin in the academic year 1981–82 in the Department of Engineering and Applied Science or in the Department of Geology and Geophysics.

Yale University is an equal opportunity employer and encourages women and members of minority groups to compete for this position.

Curriculum vitae, publications, and the names of three or more references should be sent by November 15, 1980 to: B. T. Chu, Department of Engineering and Applied Science, Box 2159 Yale Station, New Haven, CT 06520.

Electron Microscopist/Crystallographer. A research position is available in our Department of Earth & Space Sciences starting September 1, 1980. The primary responsibility is to assist in the maintenance and supervise the operation of an analytical electron microscope (JEM-200CX). Experience in analytical electron microscopy is required, as is a Ph.D. degree. Successful applicant will have ample time to pursue own research interests. Annual salary: $17,000 is currently funded for 2 years. Send letter of application with resumé and names of three references to A. E. Bence, Department of Earth & Space Sciences, SUNY at Stony Brook, Long Island, NY 11794.

An equal opportunity/affirmative action employer.

Research Physical Oceanographer. The University of Puerto Rico's Center for Energy and Environment Research (operated for U.S. DOE) invites applications of qualified Ph.D. physical oceanographers to conduct research on the interaction of the open ocean versus the nearshore waters of an island. The applicants should have strong interest in waves and eddies trapped on continental or island shelves. The appointee will have considerable independence in starting his/her own research program. S/He will work in an interdisciplinary program and interact with other marine scientists concerned with wind-induced upwelling and circulation around islands.

Qualified applicants should send resumé to José M. López, Marine Ecology Division, Center for Energy & Environment Research, College Station, Mayaguez, PR 00708.

Specialist: Beach Nearshore Processes. Opening available on or before January 1, 1981, for assistant or associate professor in littoral processes: interactions of waves and beaches, shoreline erosion, sediment transport, coastal engineering. We are looking for someone with a strong mathematical background. Candidate should hold a Ph.D. Initial appointment will be for 3 years. Send c.v. or resume, and three letters of reference, by October 1, 1980, to: J. R. Schubel, Director, Marine Sciences Research Center, SUNY at Stony Brook, Long Island, NY 11794.

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Experienced Geohydrologist. For West African survey project. One-year assignment. Minimum requirements include M.S. degree in hydrology, geology, or hydrogeology, plus 3 years practical experience, and knowledge of remote sensing. French speaking and African experience desirable.

Send resumé to Ben D. Van Tuyl, Personnel Director, Environmental Research Institute of Michigan, P. O. Box 8618, Ann Arbor, MI 48107.

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SERVICES

Scripps Remote Sensing Tutorial. This 3-day training course is meant to introduce users to the Scripps Remote Sensing Facility's capabilities. The morning lectures and afternoon hands-on labs will teach prospective users how to capture real-time satellite data, then how to process it through the Interactive Digital Image Manipulation System resident in the HP-3000 dedicated computer system. The tutorial will be held Wednesday through Friday, September 24–26, 1980, from 8:00 A.M. until 5:00 P.M. at the SRSF. There is a $50 materials fee, payable in advance. The course is limited to 12 attendees. For application forms and information, contact Ellen Barnier (telephone: 714/452-3226) or write to University of California, San Diego, SIO Mail Code A-030, La Jolla, CA 92093.

AAPG-SEPM Meeting. A research symposium sponsored by the SEPM is being organized at the 1981 Annual Meeting of the AAPG-SEPM in San Francisco, California: 'The Shelf-Slope Boundary—A Critical Interface on Continental Margins.' The symposium, the first comprehensive synthesis of the shelf-slope boundary, will bring together specialists of the morphology, structuro-stratigraphic framework, eustacism, shelf-edge carbonates and reefs, deltas, sediment dynamics, petrology and physical properties of shelf-break deposits, biogenic influence, and economic potential of the shelf break. A balance is intended between the rock record and processes on the modern sea floor. If interested in contributing to this event, contact the coconvener: D. J. Stanley, Division of Sedimentology, NMNH E-109, Smithsonian Institution, Washington, D.C. 20560.

Meetings

1980 Spring Meeting Report

Approximately 2000 participants at the 1980 Spring Meeting in Toronto welcomed the opportunity to share ideas and interact with their colleagues in an environment described in the session chairs' reports as '... excellent meeting locale, ... pleasant city, ... a good convention, and ... let's go to Toronto again.'

In addition to attending the sessions, wherein over 1500 abstracts (cumulative) were presented, attendees joined many friends and family members for an exciting evening at the Ontario Science Centre.

AGU President-Elect J. Tuzo Wilson, director-general of the Centre, shared with the participants, via arrangements made by the Women's Association of the Mining Industry of Canada, a scientific adventure so stimulating that it even upstaged the reception, dining, and dancing.

The weekend format provided an opportunity for over 100 eager explorers to take an on-the-spot look at some of the interesting geology and geophysical research facilities of the Toronto area. Niagara Falls, famous to tourists and scientists alike and only 85 miles from Toronto, proved to be the most popular of the four Sunday field trips. Walter M. Tovell and his experienced team of guides gave an element of excitement to the meeting.

An equally exciting time was afforded guests as well as some members who were able to schedule 'free time' in their program in order to partake of the free, city tour.

An adventure that was closer to the meeting functions was afforded members of the sections and the Canadian societies who attended luncheon meetings aboard Captain John's Harbour Boat Restaurant, which adjoined the Harbour Castle Hilton. The luncheons, attended by more than 300 participants, appear to be a viable vehicle for enhancing member activities.

Citations and responses from the honors banquet are being published separately in EOS. Those who attended this prestigious event shared with the families and friends of the recipients the privilege of paying tribute to their distinguished colleagues. The celebration continued with dancing and socializing late into the evening as the 1980 Spring Meeting began its final day.

The Union thanks the cosponsoring societies, the Canadian Geophysical Union, the Canadian Meteorological and Oceanographic Society, the Division of Aeronomy and Space Physics of the Canadian Society of Physics, and the Canadian Exploration Geophysical Society for their endeavor in making a success of this joint meeting.

Changes and additional abstracts are printed below.

Papers Not Presented

U11	V. Eichenlaub
G33	D. P. Hajela
GP21	W. Alvarez and W. Lowrie
GP36	R. Green
H6	W. G. Dorough and W. J. Mellema
H7	J. D. Stednick
H9	C. P. Berg and M. Matson
H10	T. D. Steele et al.
H22	D. R. Maidment and P. D. Hutchinson
H23	A. Zaporozec
H41	C. E. Neuzil and J. D. Bredehoeft
H49	M. Albertsen and G. Matthess
H53	K. L. Kipp
M17	P. J. Maroulis and A. R. Bandy
M19	H. Levy II et al.
M29	H. J. Thiebaux
M37	R. D. Holdham
M48	R. C. Schnell and S. W. Miller
M49	R. F. Pueschel et al.
M50	S. W. Miller and R. C. Schnell
M52	L. D. Duncan and R. D. H. Low
M54	R. L. Rankin
M59	S. Machiraju
M73	H. A. Singer
O4	S. Aranuvachapun
O12	H. M. Bynne and P. E. Pullen
O31	W. Hamilton
O41	L. S. Fedor et al.
O62	K. Bryan
O69	G. J. McNally and W. C. Patzert
O71	J. A. Pompa
O73	R. W. Trites
O75	G. Lagerloaf
O93	W. H. Hutson
O98	W. Alvarez et al.
O101	W. Gekelman
O104	S. Peteherych
O105	H. J. Schultz et al.
O146	R. B. Gordon et al.
O150	R. Walton and D. R. Lynch
O155	D. P. Krauel
O163	W. S. Chuang and E. M. Swenson
O193	J. O. Blanton
O196	M. W. Szabados
O207	L. Goodman and K. Kemp
O209	F. Chew and E. I. Balazs
O211	J. L. Reed
O235	A. Judge
O236	V. Neralla and R. O. Ramseier
O237	W. D. Hibler, III
P50	J. B. Bryan and L. A. Lettis
P51	R. J. Bottomley and D. York
P54	W. L. Huang
S29	G. W. Simila
S31	Allan G. Lindh
S84	M. H. Manghnani
S108	D. J. Crossley
S113	T. J. Goforth and Eugene Herrin
S114	F. W. Zwiers
S147	R. E. Houtz
S158	J. L. Chameau et al.
SA10	R. Sears et al.
SA22	E. R. Hegblom et al.
SA48	R. P. Kane
SA57	E. J. Maier et al.
SA77	B. S. Dandekar
SA80	W. A. Kolasinski
SA83	V. J. Abreu et al.
SA106	J. M. Forbes
SA107	M. A. Hagan
SA108	F. A. Marcos
SA115	R. G. Roble et al.
SA132	C. L. Rino
SA133	M. Mareschal et al.
SC6	R. E. McGuire et al.
SM66	A. Konradi et al.
SM68	M. B. Silevitch and K. G. Whipple, Jr.
SM77	G. W. Schnuelle et al.
SM80	A. G. Rubin et al.
SM81	S. Lai et al.
SM93	M. E. Greenspan et al.
SM131	J. Lyon et al.
SM135	H. H. Hilton
SM167	D. E. Jones and L. G. Shirley
SS15	I. D. Palmer
SS24	H. S. Ahluwalia
SS26	T. A. Clark and R. T. Boreiko
T48	C. Stone
T71	R. A. Stephen
T90	J. P. Pozzi et al.
T115	J. Dieterich and Z. Reches
T116	Z. Reches and J. Dieterich
T123	P. R. Hamlyn and E. Bonatti
T149	M. S. Vassiliou and T. J. Ahrens
T160	L. C. Ming and M. H. Manghnani
T168	J. Carpena et al.
V58	S. W. Kieffer
V111	R. D. Giaugue et al.
V121	K. Muelenbachs and C. R. Stern
V124	D. J. Fornari et al.
V157	D. J. Fornari and R. Jarrand
V160	K. M. Krupka et al.
V175	B. D. Velde
V200	C. R. Stern and A. Stewes

Postdeadline Abstracts

U 13A

PHYSICS AND PHYTOPLANKTON: DO THE CELLS KNOW WHAT IS GOING ON?

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In lakes and oceans there are a number of physical phenomenon which influence the growth of phytoplankton. These phenomenon operate on a wide range of time scales from minutes to years. Phytoplankton respond to these physical inputs with a number of mechanisms depending upon the period, amplitude, and phase relationships of the environmental variables. This paper surveys the input phenomenea and the algal responses and shows that a correct knowledge of scale is essential for a proper interpretation of lake and ocean processes.

In the past 20 years, there has been a tendency to use inappropriate methods and to assume equilibrium where it does not exist. This has led to incorrect modeling and management practices. Some of the implications of a changed pardigm will be discussed. It will be shown that the phytoplankton have a better "understanding" of mixed layer physics than we thought.

U 2A

CRUSTAL PROCESSES IN THE NORTH AMERICAN CRATON: MYTHS AND REALITIES

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Examples of the entire terrestrial Archean record are preserved in the North American Craton. Processes by which this crust developed are the natural consequence of the thermal and geochemical evolution of the Earth. Major sources of heat include (1) core formation, (2) meteorite impact and (3) decay of naturally occurring radioactive nuclides. During the early Archean (c. pre-3800 Ma) the thermal contribution from 3 must have been subordinate to that from 1 and 2. Dissipation of this heat was achieved by accelerated tectonic activity, resulting in faster rates of mantle convection. Thickening and stabilization of continental crust must have been controlled, as it is today by geochemical fractionation and production of an inert lithosphere. Evidence from northern Labrador indicates that this process was occurring locally c. 3500-3700 Ma ago. Crustal processes during the late Archean (c. 3000 to 2500 Ma) reflect slower rates of mantle convection and more complete preservation of newly formed crust. The impressive greenstone-plutonic belts of the Canadian Shield were largely separated from the mantle at this time. However, evidence from other areas, in particular northern Labrador, indicates extensive interaction between juvenile material and pre-existing crust, as well as regional reworking of sialic crust by partial anatexis during this period of time.

U 14A

GEOCHEMICAL STUDIES IN THE GREAT LAKES

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The Great Lakes represent a unique lake system which has provided the basis for the development of Central North America. They have provided the resources which lie at the foundation of modern North American industrial society, but in so doing have suffered the abuses of exploitation. This in large measure is reflected in the present geochemical condition which tends to obscure the natural geochemical systems of the lakes.

In recent years geochemical studies have emphasized the impact of man on Great Lakes Water Quality, particularly in resolving problems associated with eutrophication and contaminants. Historical changes have been well demonstrated by geochemical evaluation of the sedimentary record as observed in the basins of active sediment accumulation. The distribution of trace elements tend to show concentrations related to the distribution of sediment type with some conspicuous differences in concentration between the Upper and Lower Lakes. These changes are due either to the influence on the Upper Lakes of sources in the Canadian Shield or to the large anthropogenic loadings in the Lower Lakes.

Additional studies on natural and anthropogenic sources of chemical elements to the lakes have enabled the estimation of mass balances and the determination of the relative significance of such sources to the geochemical cycles of the individual lakes. For some elements, e.g. phosphorus and lead, atmospheric sources are particularly important. In this regard mineral acid deposition has not had an impact on lake pH which maintains values in the range 7 to 8. Isolated embayments in North Georgian Bay however have been reported as showing lowered pH during spring run-off.

U 16

GEOLOGY AND TECTONICS OF VENUS

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H. Masursky (USGS, Flagstaff, AZ 86001)
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The Pioneer mission to Venus has taken a major step toward providing global topographic and gravity information for the least well-known, but most Earth-like, terrestrial planet. The radar mapping experiment has provided data for a topographic map. Although the strong bimodality in the distribution of topography typical of Earth is not seen on Venus, there are several topographically distinct plateaus (Ishtar Terra, Aphrodite Terra) which stand several kilometers above the surrounding terrain and are comparable to small terrestrial continents in size. There are several mountainous regions, the highest being Maxwell Montes, rising 10.8 km above the mean radius of the planet. Gravity anomalies are observed on the scale of several thousand kilometers (±25 milligals). There is a high degree of correlation between these long wavelength gravity anomalies and topography, in contrast to the Earth. Observed topography could be sustained by convective support or by passive isostatic support. The role of volatiles may be significant--lack of water could make passive support plausible. The Pioneer/Venus mission has thus revealed the major global characteristics of Venus (topography and gravity) for the first time, and allowed comparisons with other planets. Present resolution is insufficient for the characterization of geologic processes (volcanoes, folded mountain belts, etc.) operating on the surface.